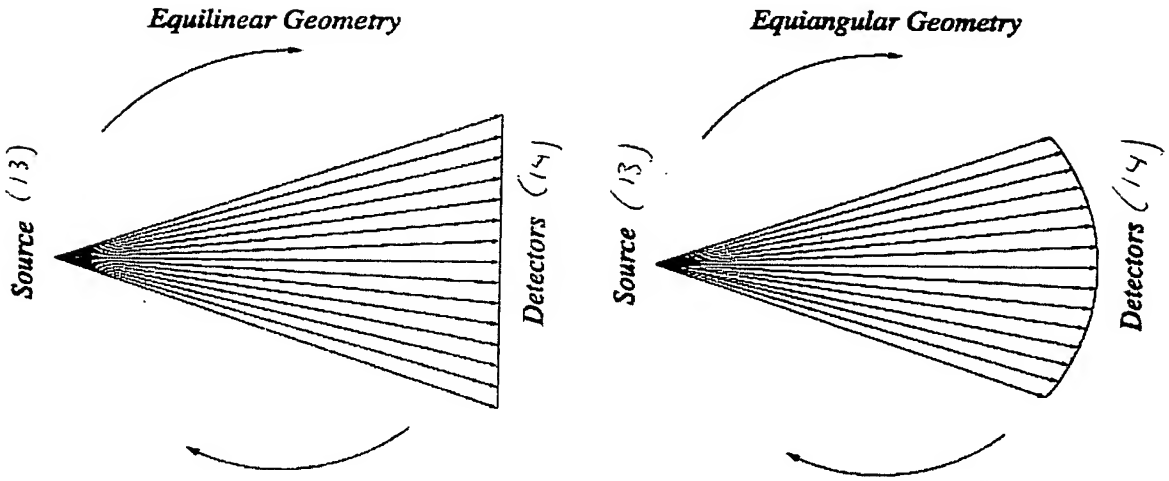

Equilinear Geometry
Source (13)
Detectors (14)
Equiangular Geometry
Source (13)
Detectors (14)

Fig. 1

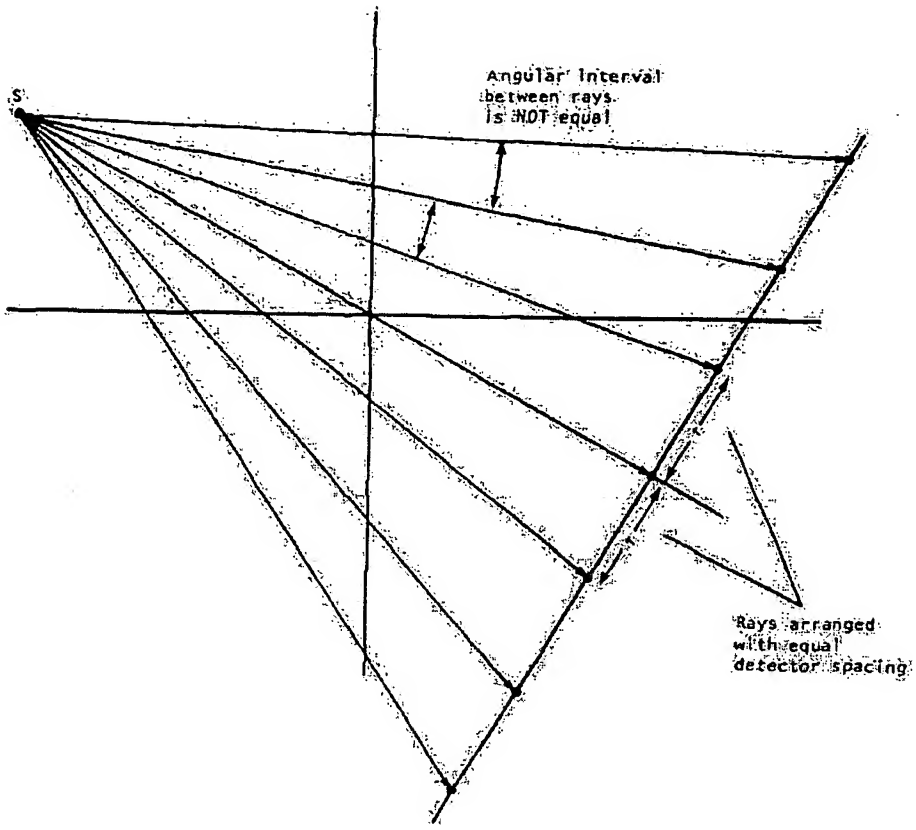

S
Angular interval between rays is NOT equal
Rays arranged with equal detector spacing

Fig. 2

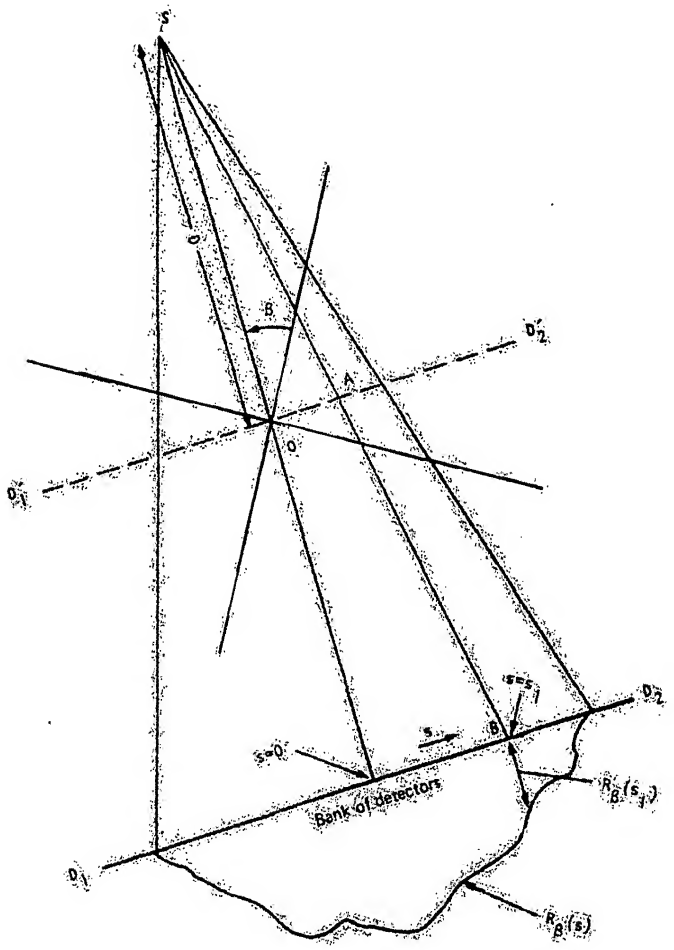


Fig. 3

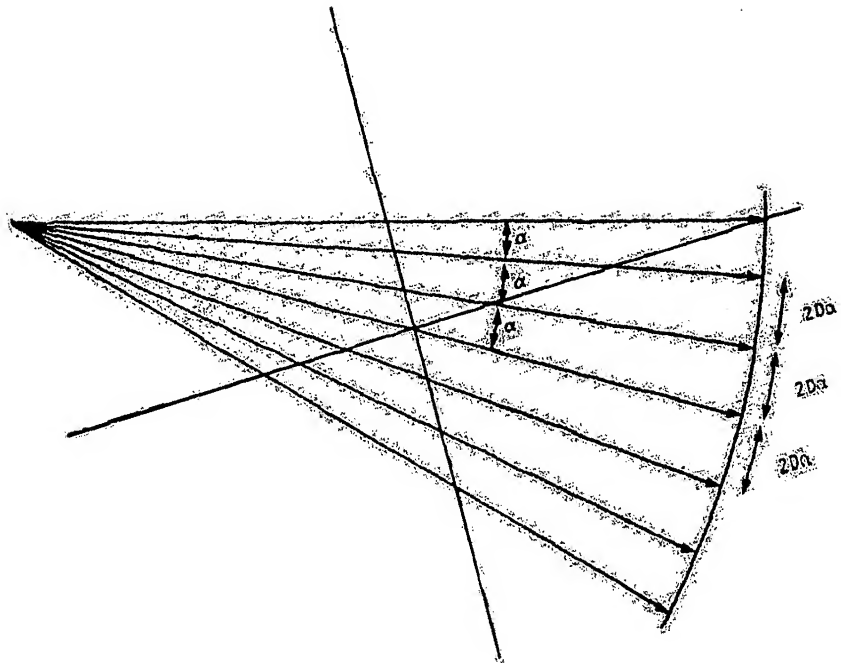


Fig. 4

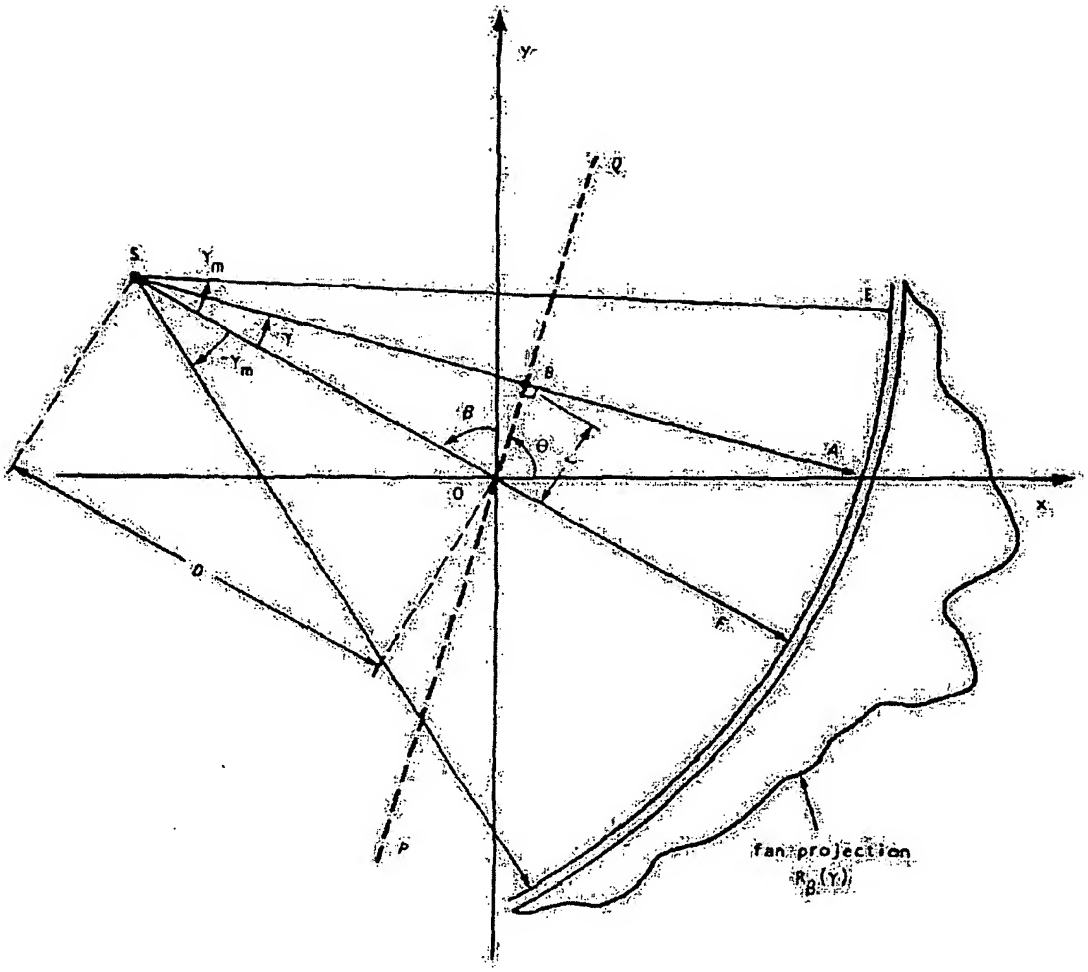

Y
Q
S
γ_m
$-\gamma_m$
γ
B
θ
A
O
X
Q
P
fan projection
$R_\beta(\gamma)$

Fig. 5

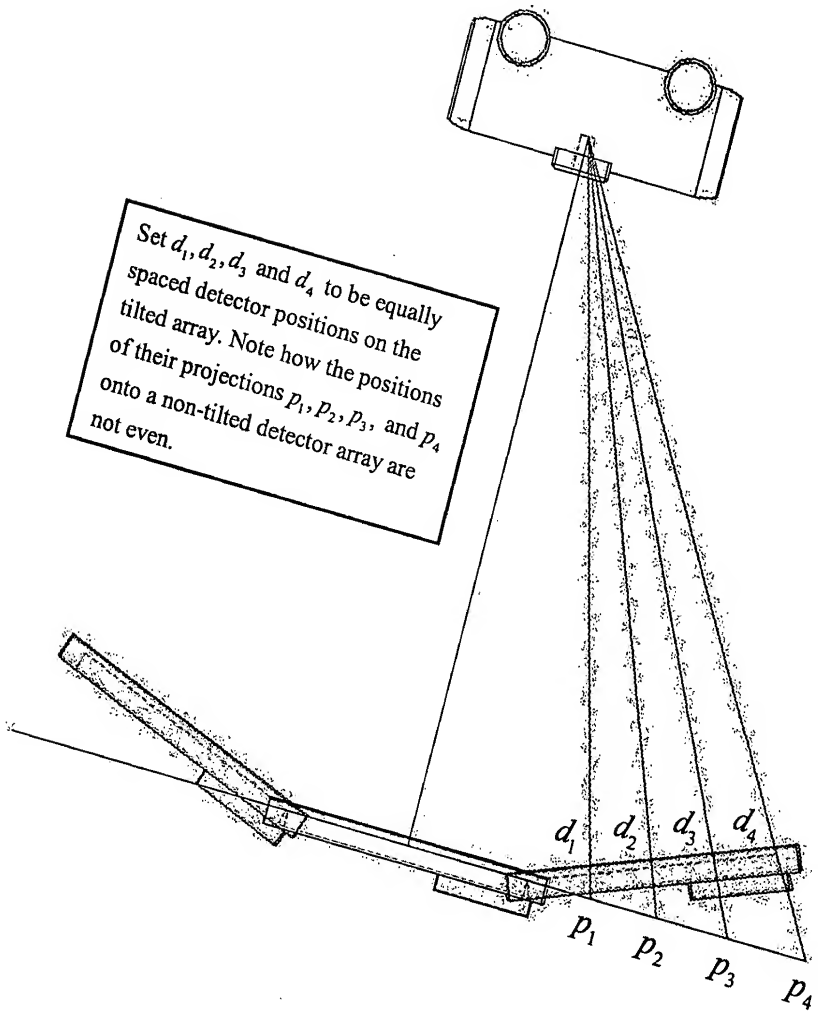
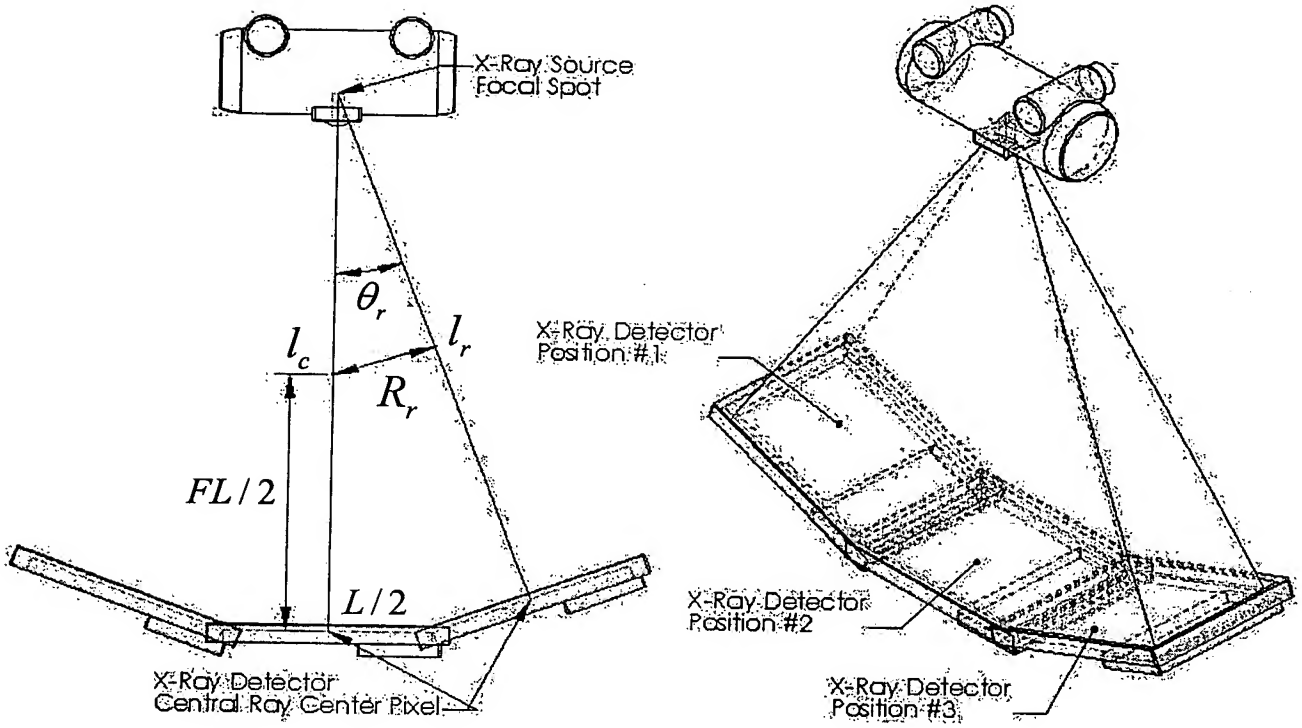
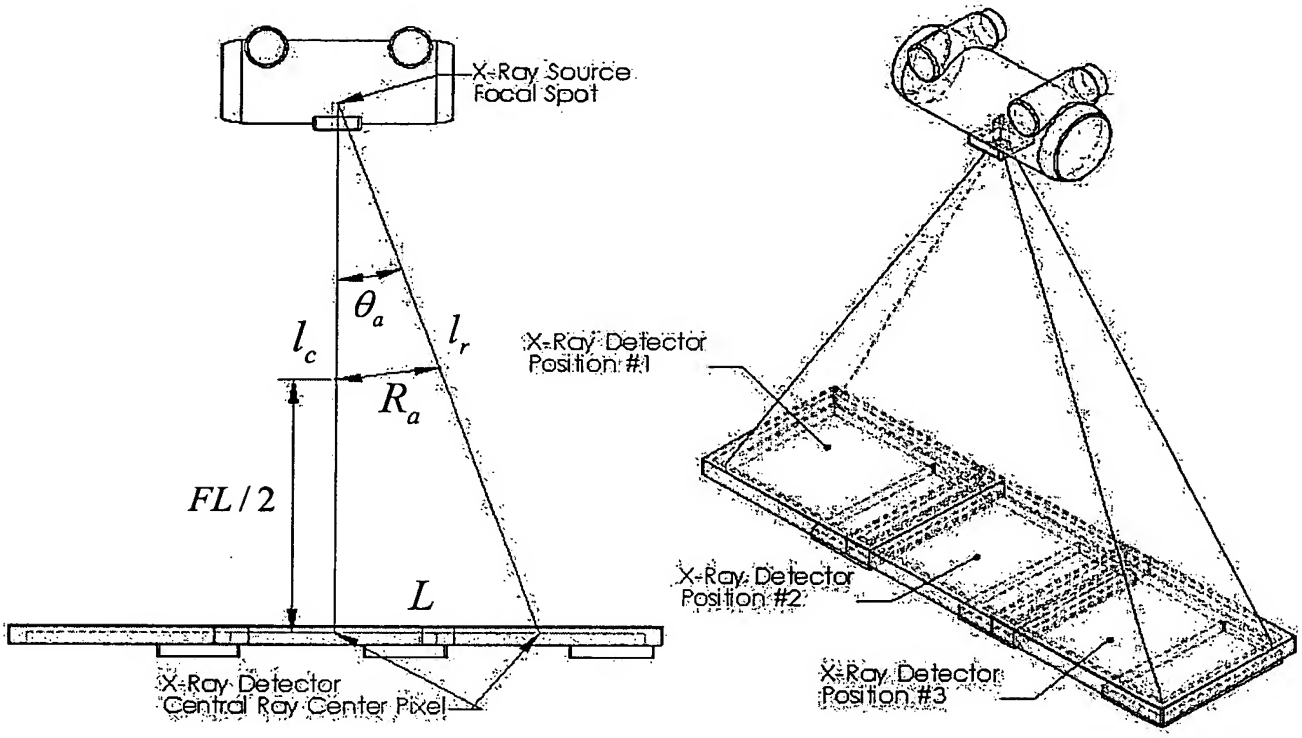

Set d_1, d_2, d_3 and d_4 to be equally spaced detector positions on the tilted array. Note how the positions of their projections p_1, p_2, p_3, and p_4 onto a non-tilted detector array are not even.
d_1
d_2
d_3
d_4
p_1
p_2
p_3
p_4

Fig. 6



Let $FL = 1000mm$ be the scanner focal length
and
$L = 400mm$ be the length of the detector
then
$\theta_r = 2 * \arctan((L/2)/FL) = 0.395rad = 22.632\deg$
and
$R_r = (FL/2) * \sin\theta_r = 192.31mm$

Fig. 7



Let $FL = 1000mm$ be the scanner focal length
and
$L = 400mm$ be the length of the detector
then
$\theta_a = \arctan(L/FL) = 0.3804rad = 21.795\deg$
and
$R_a = (FL/2) * \sin\theta_a = 185.695mm$

Fig. 8

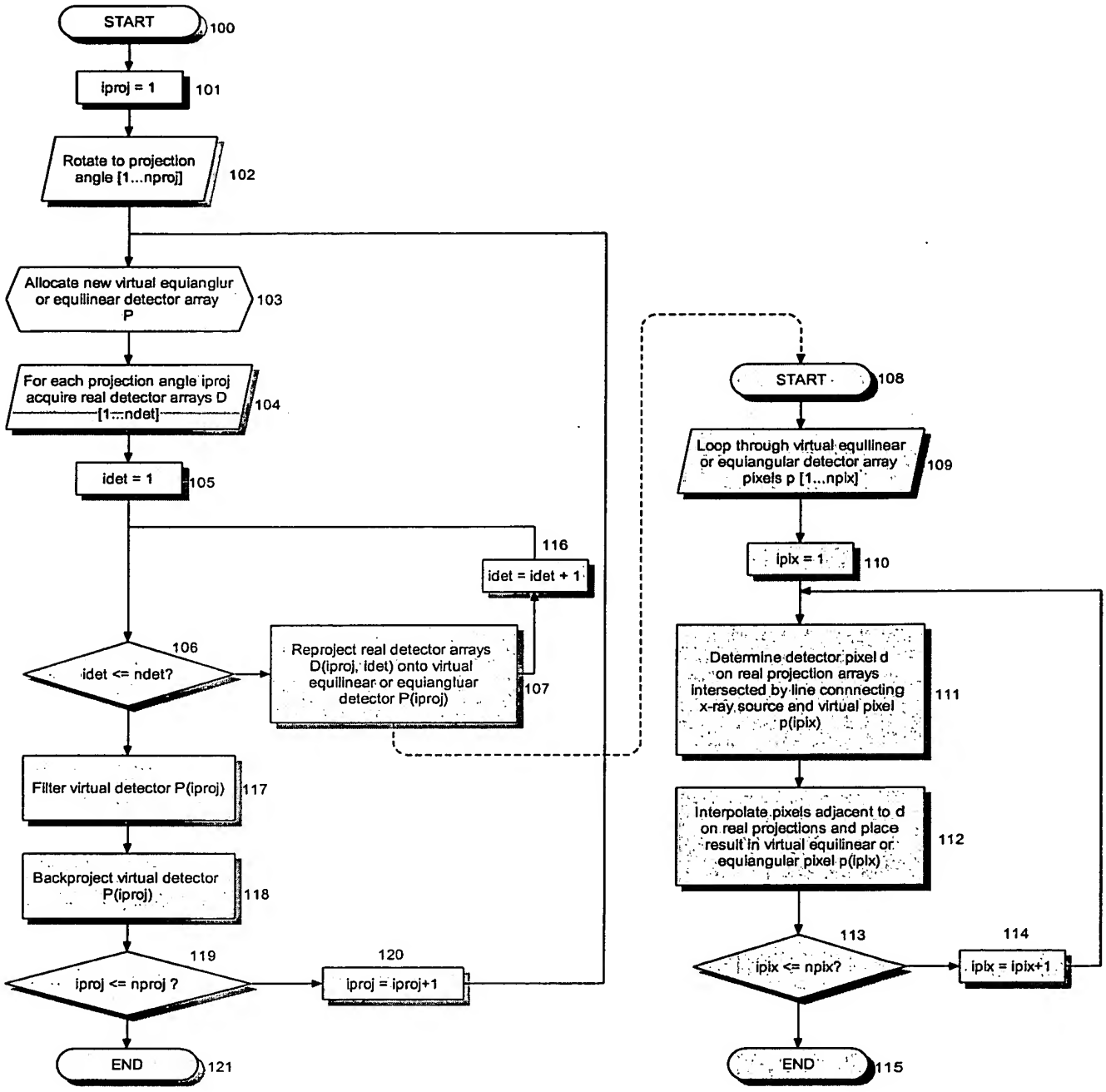

START
100
iproj = 1
101
Rotate to projection angle [1...nproj]
102
Allocate new virtual equianglur or equilinear detector array P
103
For each projection angle iproj acquire real detector arrays D [1...ndet]
104
idet = 1
105
idet <= ndet?
106
Reproject real detector arrays D(iproj, idet) onto virtual equilinear or equiangluar detector P(iproj)
107
idet = idet + 1
116
Filter virtual detector P(iproj)
117
Backproject virtual detector P(iproj)
118
iproj <= nproj ?
119
iproj = iproj+1
120
END
121
START
108
Loop through virtual equilinear or equiangular detector array pixels p [1...npix]
109
ipix = 1
110
Determine detector pixel d on real projection arrays intersected by line connnecting x-ray source and virtual pixel p(ipix)
111
Interpolate pixels adjacent to d on real projections and place result in virtual equilinear or equiangular pixel p(ipix)
112
ipix <= npix?
113
ipix = ipix+1
114
END
115

Fig. 9

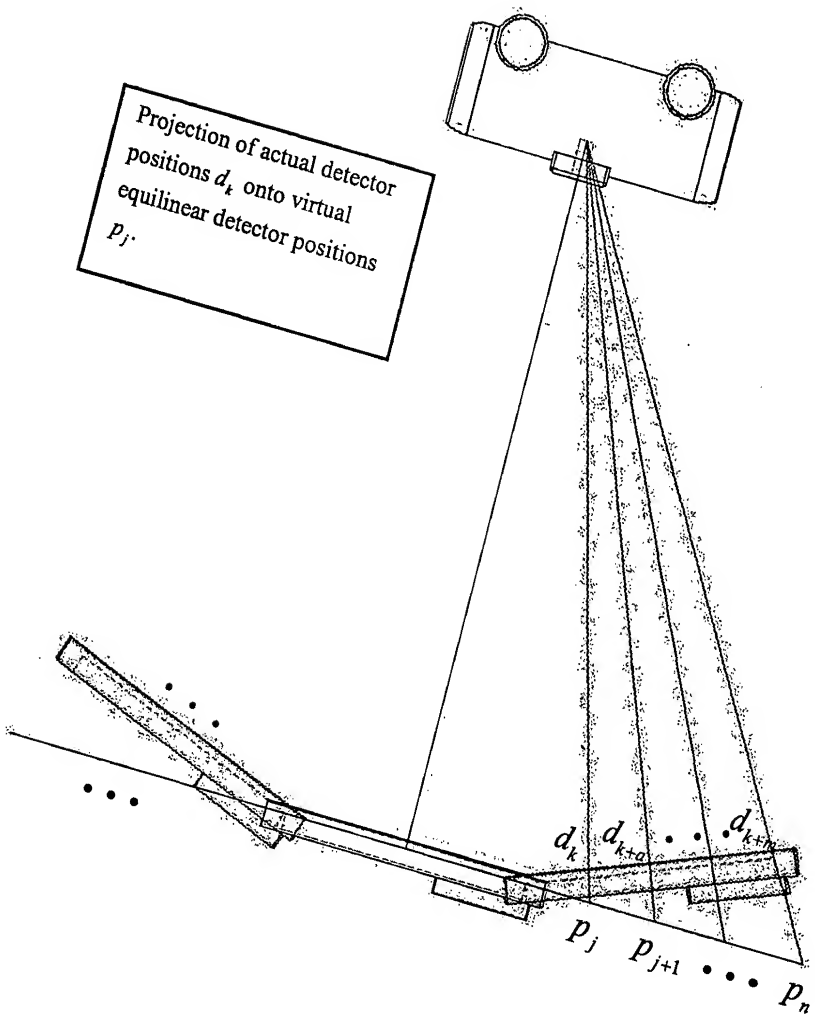

Projection of actual detector positions d_k onto virtual equilinear detector positions p_j.
d_k
d_{k+a}
d_{k+n}
p_j
p_{j+1}
p_n

Fig. 10

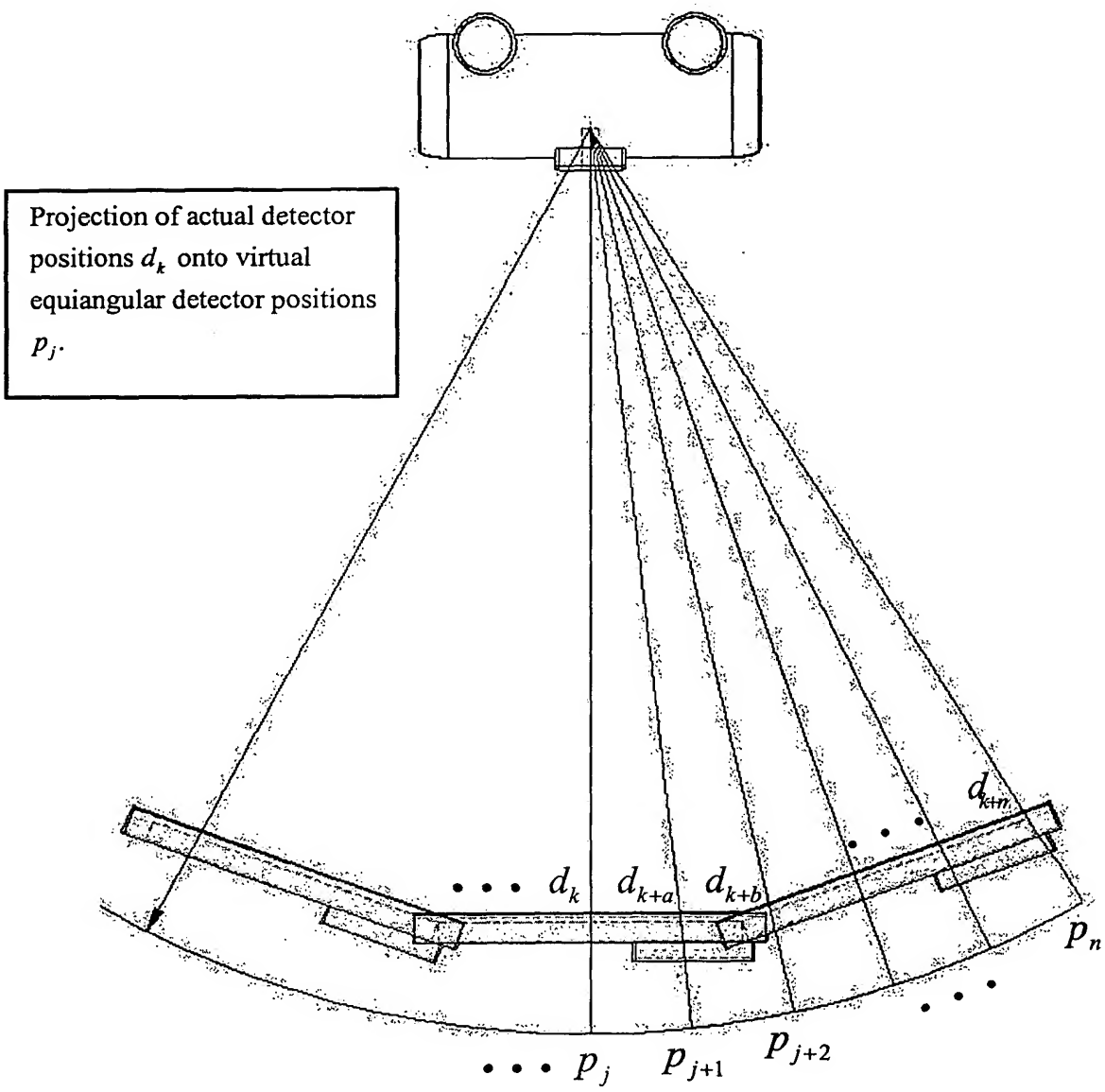

Projection of actual detector positions d_k onto virtual equiangular detector positions p_j.
d_{k+m}
d_k
d_{k+a}
d_{k+b}
p_n
p_j
p_{j+1}
p_{j+2}

Fig. 11